

WHAT IS CLAIMED IS:

1. A receiving apparatus in a communication system for encoding transmit data of a plurality of channels at respective ones of transmission time intervals,
  - 5 partitioning the encoded data of each channel at a frame period to obtain frame data of prescribed bit lengths, transmitting and multiplexing the frame data of each channel, and transmitting, frame by frame, identification information that specifies frame-data
  - 10 length information of the frame data on each channel, said apparatus comprising:
    - a storage unit for storing multiplexed data that has been received;
    - a discrimination unit for discriminating, frame by
    - 15 frame, frame-data length information on each channel based upon the identification information that has been received;
    - a decision unit for deciding, on a per-channel basis that the largest number of items of frame-data
    - 20 length information that are the same among the items of frame-data length information in a plurality of frames within a transmission time interval is frame-data length information common to all of said plurality of frames within the transmission time interval;
    - 25 a demultiplexer for identifying bit length per frame of each channel based upon the frame-data length information that has been decided, and demultiplexing multiplexed data, which has been stored in the storage

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unit, channel by channel on the basis of the bit length;  
and

a decoder for joining and decoding, in an amount  
equivalent to the transmission time interval, frame data  
5 that has been demultiplexed on a per-channel basis.

2. A receiving apparatus in a communication system for  
encoding transmit data of a plurality of channels at  
respective ones of transmission time intervals,  
partitioning the encoded data of each channel at a frame  
10 period to obtain frame data of prescribed bit lengths,  
transmitting and multiplexing the frame data of each  
channel, encoding identification information that  
specifies frame-data length information of the frame  
data on each channel, and transmitting the encoded  
15 information frame by frame, said apparatus comprising:

a storage unit for storing multiplexed data that  
has been received;

an identification information decoder for decoding  
the identification information that has been received  
20 and holding likelihood calculated when the decoding is  
performed;

a discrimination unit for discriminating, frame by  
frame, the frame-data length information on each channel  
based upon the identification information that has been  
25 decoded;

a decision unit for comparing, on a per-channel  
basis, frame-data length information of a plurality of  
frames within respective ones of the transmission time

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intervals and, if frame-data length information differs, deciding, by using the likelihood, frame-data length information that is common to all of the plurality of frames within the transmission time interval;

- 5       a demultiplexer for identifying bit length per frame of each channel based upon the frame-data length information that has been decided, and demultiplexing multiplexed data, which has been stored in the storage unit, channel by channel on the basis of the bit length;
- 10   and

        a decoder for joining and decoding, in an amount equivalent to the transmission time interval, frame data that has been demultiplexed on a per-channel basis.

3. A receiving apparatus in a communication system for
- 15   encoding transmit data of each of a plurality of channels at a prescribed transmission time interval, partitioning the encoded data of each channel at a frame period to obtain frame data of a prescribed bit length, transmitting and multiplexing the frame data of each
- 20   channel, and transmitting, frame by frame, identification information that specifies a combination of frame-data length information of each channel, said apparatus comprising:

- a storage unit for storing multiplexed data that
- 25   has been received;

        a discrimination unit for discriminating, frame by frame, the frame-data length information on each channel based upon the identification information that has been

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received;

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a decision unit for correcting erroneous frame-data  
length information, among frame-data length information  
of a plurality of frames within a transmission time  
5 interval T1 on a channel whose transmission time  
interval is T1, to correct frame-data length information,  
and, when deciding frame-data length information common  
to a plurality of frames within a transmission time  
interval T2 on another channel inclusive of a frame  
10 corresponding to the corrected frame on said channel  
whose transmission time interval is T2, deciding upon  
frame-data length information, which has been  
discriminated with regard to a frame other than the  
frame corresponding to the corrected frame, as the  
15 common frame-data length information;

a demultiplexer for identifying bit length per  
frame of each channel based upon the frame-data length  
information that has been decided, and demultiplexing  
multiplexed data, which has been stored in said storage  
20 unit, channel by channel on the basis of the bit length;  
and

a decoder for joining and decoding, in an amount  
equivalent to the transmission time interval, frame data  
that has been demultiplexed on a per-channel basis.  
25 4. The apparatus according to claim 3, wherein  $T1 > T2$   
holds.

5. A receiving apparatus in a communication system for  
encoding transmit data of each of a plurality of

channels at a prescribed transmission time interval,  
partitioning the encoded data of each channel at a frame  
period to obtain frame data of a prescribed bit length,  
transmitting and multiplexing the frame data of each  
5 channel, and transmitting, frame by frame,  
identification information that specifies a combination  
of frame-data length information of each channel, said  
apparatus comprising:

10 a storage unit for storing multiplexed data that  
has been received;

a discrimination unit for discriminating, frame by  
frame, the frame-data length information on each channel  
based upon the identification information that has been  
received;

15 a demultiplexer for identifying bit length per  
frame of each channel based upon the frame-data length  
information that has been discriminated, regarding that  
frame data of each of the channels has been multiplexed  
in order of decreasing transmission time interval and  
20 demultiplexing the multiplexed data, which has been  
stored in said storage unit, on the basis of the  
multiplexing sequence and the identified bit length of  
each channel; and

a decoder for joining and decoding, in an amount  
25 equivalent to the respective transmission time interval,  
the frame data that has been demultiplexed on a per-  
channel basis.

6. A transmitting apparatus comprising:

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an encoder for encoding transmit data of each of a plurality of channels at a prescribed transmission time interval;

5 a multiplexer for partitioning the encoded transmit data of each channel at a frame period to obtain frame data of a prescribed bit length and, among the frame data of each of the channels, multiplexing the frame data in such a manner that frame data having a long transmission time interval will come at the beginning or  
10 such that frame data having a short transmission time interval will come at the end; and

a transmitting unit for transmitting, frame by frame together with the multiplexed data, identification information that specifies a combination of frame-data  
15 length information of each channel multiplexed.

7. A receiving method in a communication system for encoding transmit data of a plurality of channels at respective ones of transmission time intervals, partitioning the encoded data of each channel at a frame  
20 period to obtain frame data of prescribed bit lengths, transmitting and multiplexing the frame data of each channel, and transmitting, frame by frame, identification information that specifies frame-data length information of the frame data of each channel,  
25 said method comprising the steps of:

storing multiplexed data that has been received and discriminating, frame by frame, frame-data length information on each channel based upon identification

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information that has been received;

deciding, on a per-channel basis, that the largest number of items of frame-data length information that are the same among the items of frame-data length

5 information in a plurality of frames within a transmission time interval is frame-data length information common to all of said plurality of frames within the transmission time interval;

identifying bit length per frame of each channel  
10 based upon the frame-data length information that has been decided;

demultiplexing multiplexed data, which has been stored in the storage unit, channel by channel on the basis of the bit length; and

15 joining and decoding, in an amount equivalent to the transmission time interval, frame data that has been demultiplexed on a per-channel basis.

8. A receiving method in a communication system for encoding transmit data of a plurality of channels at

20 respective ones of transmission time intervals, partitioning the encoded data of each channel at a frame period to obtain frame data of prescribed bit lengths, transmitting and multiplexing the frame data of each channel, and transmitting, frame by frame,

25 identification information that specifies frame-data length information of the frame data on each channel, said method comprising the steps of:

storing multiplexed data that has been received,

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decoding the identification information that has been received and holding likelihood calculated when the decoding is performed;

discriminating the frame-data length information on  
5 each channel based upon the identification information that has been decoded;

comparing, on a per-channel basis, frame-data length information of a plurality of frames within respective ones of the transmission time intervals and,  
10 if frame-data length information differs, deciding, by using the likelihood, frame-data length information that is common to all of the plurality of frames within the transmission time interval;

identifying bit length per frame of each channel  
15 based upon the frame-data length information that has been decided;

demultiplexing multiplexed data, which has been stored, channel by channel on the basis of the bit length; and

20 joining and decoding, in an amount equivalent to the transmission time interval, frame data that has been demultiplexed on a per-channel basis.

9. A receiving method in a communication system for encoding transmit data of each of a plurality of  
25 channels at a prescribed transmission time interval, partitioning the encoded data of each channel at a frame period to obtain frame data of a prescribed bit length, transmitting and multiplexing the frame data of each

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channel, and transmitting, frame by frame,  
identification information that specifies a combination  
of frame-data length information of each channel, said  
method comprising the steps of:

- 5       storing multiplexed data that has been received and  
discriminating, frame by frame, the frame-data length  
information on each channel based upon the  
identification information that has been received;

- correcting erroneous frame-data length information,  
10   among frame-data length information of a plurality of  
frames within a transmission time interval T1 on a  
channel whose transmission time interval is T1, to  
correct frame-data length information, and, when  
deciding frame-data length information common to a  
15   plurality of frames within a transmission time interval  
T2 on another channel inclusive of frame corresponding  
to the corrected frame on said channel whose  
transmission time interval is T2, deciding upon frame-  
data length information, which has been discriminated  
20   with regard to a frame other than the frame  
corresponding to the corrected frame, as the common  
frame-data length information;

- identifying bit length per frame of each channel  
based upon the frame-data length information that has  
25   been decided;

          demultiplexing multiplexed data, which has been  
stored, channel by channel on the basis of the bit  
length; and

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joining and decoding, in an amount equivalent to the transmission time interval, frame data that has been demultiplexed on a per-channel basis.

10. A receiving method in a communication system for  
5 encoding transmit data of each of a plurality of channels at a prescribed transmission time interval, partitioning the encoded data of each channel at a frame period to obtain frame data of a prescribed bit length, transmitting and multiplexing the frame data of each  
10 channel, and transmitting, frame by frame, identification information that specifies a combination of frame-data length information of each channel, said method comprising the steps of:

storing multiplexed data that has been received and  
15 discriminating, frame by frame, the frame-data length information on each channel based upon the identification information that has been received;

identifying bit length per frame of each channel based upon the frame-data length information that has  
20 been discriminated;

regarding that frame data of each of the channels has been multiplexed in order of decreasing transmission time interval and demultiplexing the stored multiplexed data on the basis of the multiplexing sequence and the  
25 identified bit length of each channel; and

joining and decoding, in an amount equivalent to the respective transmission time interval, the frame data that has been demultiplexed on a per-channel basis.

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11. A transmitting method in a communication system,  
comprising the steps of:

encoding transmit data of each of a plurality of  
channels at a prescribed transmission time interval;

5 partitioning the encoded transmit data of each  
channel at a frame period to obtain frame data of a  
prescribed bit length and, among the frame data of each  
of the channels, multiplexing the frame data in such a  
manner that frame data having a long transmission time  
10 interval will come at the beginning or such that frame  
data having a short transmission time interval will come  
at the end; and

transmitting, frame by frame together with the  
multiplexed data, identification information that  
15 specifies a combination of frame-data length information  
of each channel multiplexed.

12. A receiving apparatus in a CDMA communication  
system for encoding transmit data of each of a plurality  
of transport channels at a predetermined transmission  
20 time interval (TTI), partitioning the encoded data of  
each transport channel at a frame period to obtain frame  
data of a prescribed bit length, multiplexing and  
transmitting the frame data of each transport channel,  
and transmitting, frame by frame, combination  
25 information (TFCI) of transport formats (TFIs) that  
specify the frame data length of each transport channel,  
said apparatus comprising:

a storage unit for storing multiplexed data that

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has been received;

a transport format discrimination unit for decoding the TFCI frame by frame and discriminating a transport format (TFI) in each transport channel frame by frame  
5 based upon the TFCI;

a transport format decision unit for comparing, on a per-transport-channel basis, transport formats (TFIs) of a plurality of frames within a prescribed transmission time interval (TTI) that conforms to the  
10 transport channel and, if transport formats differ, deciding a transport format (TFI) in the transmission time interval (TTI) by majority decision;

a demultiplexer for identifying bit length per frame of each transport channel based upon the transport  
15 format (TFI) decided and demultiplexing multiplexed data, which has been stored in said storage unit, channel by channel on the basis of the bit length; and

a decoder for joining and decoding, in an amount equivalent to the transmission time interval, frame data  
20 that has been demultiplexed on a per-transport-channel basis.

13. A receiving apparatus in a CDMA communication system for encoding transmit data of each of a plurality of transport channels at a predetermined transmission  
25 time interval (TTI), partitioning the encoded data of each transport channel at a frame period to obtain frame data of a prescribed bit length, multiplexing and transmitting the frame data of each transport channel,

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and transmitting, frame by frame, combination information (TFCI) of transport formats (TFIs) that specify the frame data length of each transport channel, said apparatus comprising:

5       a storage unit for storing multiplexed data that has been received;

          a TFCI decoder for decoding the TFCI frame by frame and holding likelihood calculated when the decoding is performed;

10       a transport format discrimination unit for discriminating, frame by frame, the transport format (TFI) on each transport channel based upon the TFCI that has been decoded;

          a transport format decision unit for comparing, on  
15   a per-transport-channel basis, transport formats (TFIs) of a plurality of frames within a transmission time interval (TTI) that conforms to the transport channel and, if transport formats differ, deciding a transport format (TFI) in the transmission time interval (TTI)  
20   using likelihood and transport format (TFI) of each frame;

          a demultiplexer for identifying bit length per frame of each transport channel based upon the transport format decided and demultiplexing the multiplexed data,  
25   which has been stored in said storage unit, channel by channel on the basis of the bit length; and

          a decoder for joining and decoding, in an amount equivalent to the transmission time interval, frame data

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that has been demultiplexed on a per-transport-channel basis.

14. The apparatus according to claim 13, wherein said transport format decision unit totals the likelihoods of  
5 identical transport formats (TFIs) and decides upon the transport format (TFI) for which the total of the likelihoods is largest as the transport format (TFI) in the transmission time interval (TTI).

15. The apparatus according to claim 13, wherein said  
10 TFCI decoder decides upon a TFCI candidate, which has the highest likelihood among the likelihoods of TFCI candidates calculated at the time of decoding, as the TFCI in a frame of interest, calculates degree of reliability of the TFCI using the likelihood of each  
15 TFCI candidate and holds the degree of reliability calculated; and

said transport format decision unit decides upon a transport format (TFI) for which the degree of reliability is highest as the transport format (TFI) in  
20 the transmission time interval (TTI).

16. A receiving apparatus in a CDMA communication system for encoding transmit data of each of a plurality of transport channels at a predetermined transmission time interval (TTI), partitioning the encoded data of  
25 each transport channel at a frame period to obtain frame data of a prescribed bit length, multiplexing and transmitting the frame data of each transport channel, and transmitting, frame by frame, combination

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information (TFCI) of transport formats (TFIs) that specify the frame data length of each transport channel, said apparatus comprising:

5 a storage unit for storing multiplexed data that has been received;

a TFCI decoder for decoding the TFCI frame by frame;

10 a transport format discrimination unit for discriminating, frame by frame, the transport format (TFI) on each transport channel based upon the TFCI that has been decoded;

15 a transport format decision unit which, in a transport channel of a longest transmission time interval (TTI), is for correcting, to a correct TFI, an erroneous transport format (TFI) among transport formats (TFIs) of a plurality of frames within the longest transmission time interval, and which, in a different transport channel, is for checking to determine whether transport formats (TFIs) of a plurality of frames within  
20 a transmission time interval that conforms to the other transport channel inclusive of the corrected frame agree, said transport format decision unit judging, if transport formats do not agree, that a transport format in a frame other than the corrected frame is correct and  
25 deciding the transport format (TFI) in the transmission time interval (TTI);

a demultiplexer for identifying bit length per frame of each transport channel based upon the transport

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format decided and demultiplexing the multiplexed data, which has been stored in said storage unit, channel by channel on the basis of the bit length; and

5 a decoder for joining and decoding, in an amount equivalent to the transmission time interval, frame data that has been demultiplexed on a per-transport-channel basis.

10 17. A receiving apparatus in a CDMA communication system for encoding transmit data of each of a plurality of transport channels at a predetermined transmission time interval (TTI), partitioning the encoded data of each transport channel at a frame period to obtain frame data of a prescribed bit length, multiplexing and transmitting the frame data of each transport channel, and transmitting, frame by frame, combination  
15 information (TFCI) of transport formats (TFIs) that specify the frame data length of each transport channel, said apparatus comprising:

20 a storage unit for storing multiplexed data that has been received;

a TFCI decoder for decoding the TFCI frame by frame;

25 a transport format discrimination unit for discriminating, frame by frame, the transport format (TFI) on each transport channel based upon the TFCI that has been decoded;

a demultiplexer for identifying bit length per frame of each transport channel based upon the transport

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format (TFI) discriminated, regarding that frame data of each of the transport channels has been multiplexed in order of decreasing transmission time interval (TTI) and demultiplexing the multiplexed data, which has been  
5 stored in said storage unit, channel by channel on the basis of the multiplexing sequence and identified bit length; and

a decoder for joining and decoding, in an amount equivalent to the transmission time interval, frame data  
10 that has been demultiplexed on a per-transport-channel basis.

18. A transmitting apparatus in a CDMA communication system, comprising:

an encoder for encoding transmit data of each of a  
15 plurality of transport channels at a prescribed transmission time interval (TTI);

a multiplexer for partitioning the encoded data at a frame period to obtain frame data of a prescribed bit length, and multiplexing the frame data of each  
20 transport channel in order of decreasing transmission time interval (TTI); and

a transmitting unit for transmitting, frame by frame together with the multiplexed data, combination information (TFCI) of transport formats (TFIs) that  
25 specify the frame data length of each transport channel.

19. A receiving method in a CDMA communication system for encoding transmit data of each of a plurality of transport channels at a predetermined transmission time

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interval (TTI), partitioning the encoded data of each transport channel at a frame period to obtain frame data of a prescribed bit length, multiplexing and transmitting the frame data of each transport channel, and transmitting, frame by frame, combination information (TFCI) of transport formats (TFIs) that specify the frame data length of each transport channel, said method comprising the steps of:

- storing received multiplexed data and decoding a TFCI frame by frame;
  - discriminating a transport format (TFI) in each transport channel frame by frame based upon the TFCI of every frame;
  - comparing, on a per-transport-channel basis, transport formats (TFIs) of a plurality of frames within a transmission time interval (TTI) that conforms to the transport channel and, if transport formats differ, deciding a transport format (TFI) in the transmission time interval (TTI) by majority decision;
  - identifying bit length per frame of each transport channel based upon the transport format (TFI) decided;
  - demultiplexing the stored multiplexed data channel by channel on the basis of the bit length; and
  - joining and decoding, in an amount equivalent to the transmission time interval, frame data that has been demultiplexed on a per-transport-channel basis.
20. A receiving method in a CDMA communication system for encoding transmit data of each of a plurality of

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transport channels at a predetermined transmission time interval (TTI), partitioning the encoded data of each transport channel at a frame period to obtain frame data of a prescribed bit length, multiplexing and

5 transmitting the frame data of each transport channel, and transmitting, frame by frame, combination information (TFCI) of transport formats (TFIs) that specify the frame data length of each transport channel, said method comprising the steps of:

10 storing multiplexed data that has been received, decoding the TFCI frame by frame and holding likelihood calculated when the decoding is performed;

discriminating a transport format (TFI) in each transport channel frame by frame based upon the TFCI of  
15 every frame;

comparing, on a per-transport-channel basis, transport formats (TFIs) of a plurality of frames within a transmission time interval (TTI) that conforms to the transport channel and, if transport formats differ,  
20 deciding a transport format (TFI) in the transmission time interval (TTI) using the likelihood and transport format (TFI) of each frame;

identifying bit length per frame of each transport channel based upon the transport format (TFI) decided;

25 demultiplexing the stored multiplexed data channel by channel on the basis of the bit length; and

joining and decoding, in an amount equivalent to the transmission time interval, frame data that has been

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demultiplexed on a per-transport-channel basis.

21. The method according to claim 20, further comprising the step of totaling the likelihoods of identical transport formats (TFIs) and deciding upon the transport format (TFI) for which the total of the likelihoods is largest as the transport format (TFI) in the transmission time interval (TTI).

22. The method according to claim 20, further comprising the steps of:

10       deciding upon a TFCI candidate, which has the highest likelihood among the likelihoods of TFCI candidates calculated at the time of decoding, as the TFCI in a frame of interest, calculating degree of reliability of the TFCI using the likelihood of each TFCI candidate, and holding the degree of reliability calculated; and

      deciding upon a transport format (TFI) for which the degree of reliability is highest as the transport format (TFI) in the transmission time interval (TTI).

20   23. A receiving method in a CDMA communication system for encoding transmit data of each of a plurality of transport channels at a predetermined transmission time interval (TTI), partitioning the encoded data of each transport channel at a frame period to obtain frame data of a prescribed bit length, multiplexing and transmitting the frame data of each transport channel, and transmitting, frame by frame, combination information (TFCI) of transport formats (TFIs) that

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specify the frame data length of each transport channel,  
said method comprising the steps of:

storing received multiplexed data and decoding a  
TFCI frame by frame;

5 discriminating, frame by frame, the transport  
format (TFI) on each transport channel based upon the  
TFCI that has been decoded;

10 in a transport channel of a longest transmission  
time interval (TTI), correcting, to a correct TFI, an  
erroneous transport format (TFI) among transport formats  
(TFIs) of a plurality of frames within the longest  
transmission time interval, in a different transport  
channel, checking to determine whether transport formats  
(TFIs) of a plurality of frames within a transmission  
15 time interval that conforms to the other transport  
channel inclusive of the corrected frame agree and, if  
transport formats do not agree, deciding that a  
transport format in a frame other than the corrected  
frame is correct and correcting the transport format  
20 (TFI) in the transmission time interval (TTI);

identifying bit length per frame of each transport  
channel based upon the corrected transport format (TFI);

demultiplexing the stored multiplexed data channel  
by channel on the basis of the bit length; and

25 joining and decoding, in an amount equivalent to  
the transmission time interval, frame data that has been  
demultiplexed on a per-transport-channel basis.

24. A receiving method in a CDMA communication system

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for encoding transmit data of each of a plurality of transport channels at a predetermined transmission time interval (TTI), partitioning the encoded data of each transport channel at a frame period to obtain frame data  
5 of a prescribed bit length, multiplexing and transmitting the frame data of each transport channel, and transmitting, frame by frame, combination information (TFCI) of transport formats (TFIs) that specify the frame data length of each transport channel,  
10 said method comprising the steps of:  
    storing received multiplexed data and decoding a TFCI frame by frame;  
    discriminating, frame by frame, the transport format (TFI) on each transport channel based upon the  
15 TFCI that has been decoded;  
    identifying bit length per frame of each transport channel based upon the transport format (TFI) discriminated;  
    regarding that frame data of each of the transport  
20 channels has been multiplexed in order of decreasing transmission time interval (TTI) and demultiplexing the stored multiplexed data channel by channel on the basis of the multiplexing sequence and identified bit length; and  
25 joining and decoding, in an amount equivalent to the transmission time interval, frame data that has been demultiplexed on a per-transport-channel basis.  
25. A transmitting method in a communication system,

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comprising the steps of:

encoding transmit data of each of a plurality of transport channels at a prescribed transmission time interval (TTI);

5        partitioning the encoded data at a frame period to obtain frame data of a prescribed bit length and multiplexing the frame data of each of the transport channels in order of decreasing transmission time interval (TTI);

10        transmitting, together with the multiplexed data, combination information (TFCI) of transport formats (TFIs) that specify the frame data length of each transport channel.

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